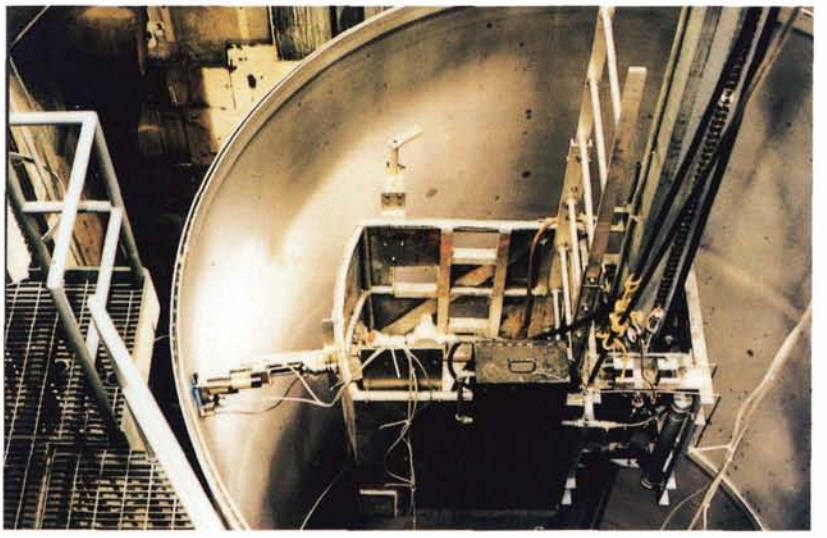
Inspection Tools



At right, a segment of a Space Shuttle Solid Rocket Motor is being scanned by a motorized contamination sensing device to assure surface cleanliness prior to bonding of a rubber liner.

The sensor and scanning system are part of a family of OP1000 Surface Quality Monitors developed by Photo Acoustic Technology Inc. (PAT), Westlake Village, California. The monitors are based on an inspection tool and technique known as Optically Stimulated Electron Emission (OSEE), invented in the early 1980s by Dr. Tennyson Smith of Rockwell International Corporation under contract to Marshall Space Flight Center.

PAT, which produces the sensors and scanning systems but not the associated robotics, was founded on this technology, which is described as a significant advance in measuring thin layer contamination on the surface of a material. PAT founders, including Mantosh Chawla, president and chief executive, learned of the technology through an article in Tech Briefs, a NASA publication that reports on new inventions or innovations developed in the course of NASA programs to let potential users know of technology available for transfer.

That beginning led to the development by PAT of the OP1000 line, a series of non-destructive, non-contact surface contamination detection systems with wide industrial applicability. Some examples: inspection of a variety of surfaces prior to bonding, coating, painting, plating, etching, soldering, brazing or welding; measurement of lubricant thickness in computer hard disks; examination of the surface chemistry of printed circuit boards; inspection of blank semiconductor wafers prior to processing; and on-line inspection of metal sheeting. The OP1000 series' realtime pre-processing detection capability assures 100 percent surface quality testing and reduces the need for destructive sample testing after the product process is completed.

The OSEE technique involves brief exposure of the surface to be inspected to high energy, low intensity ultraviolet radiation. The ultraviolet energy interacts with the surface layer, causing free electrons to be emitted from the surface; these emissions are picked up by the OP1000 system's detector.

Where contamination exists, in the form of very thin layer substances, it interferes with the electron flow and the degree of interference is proportionate to the thickness of the contaminant layer; this enables measurement of the thickness by means of system signal output that is proportional to the electron flow. A high output reading in the system's display window indicates a clean or acceptable surface; a low reading shows the presence of foreign matter and the level of contamination. OP1000 systems operate in a conventional atmosphere and do not require vacuum chambers or strict temperature control; they work on virtually any type of material and can detect either organic or inorganic contamination.